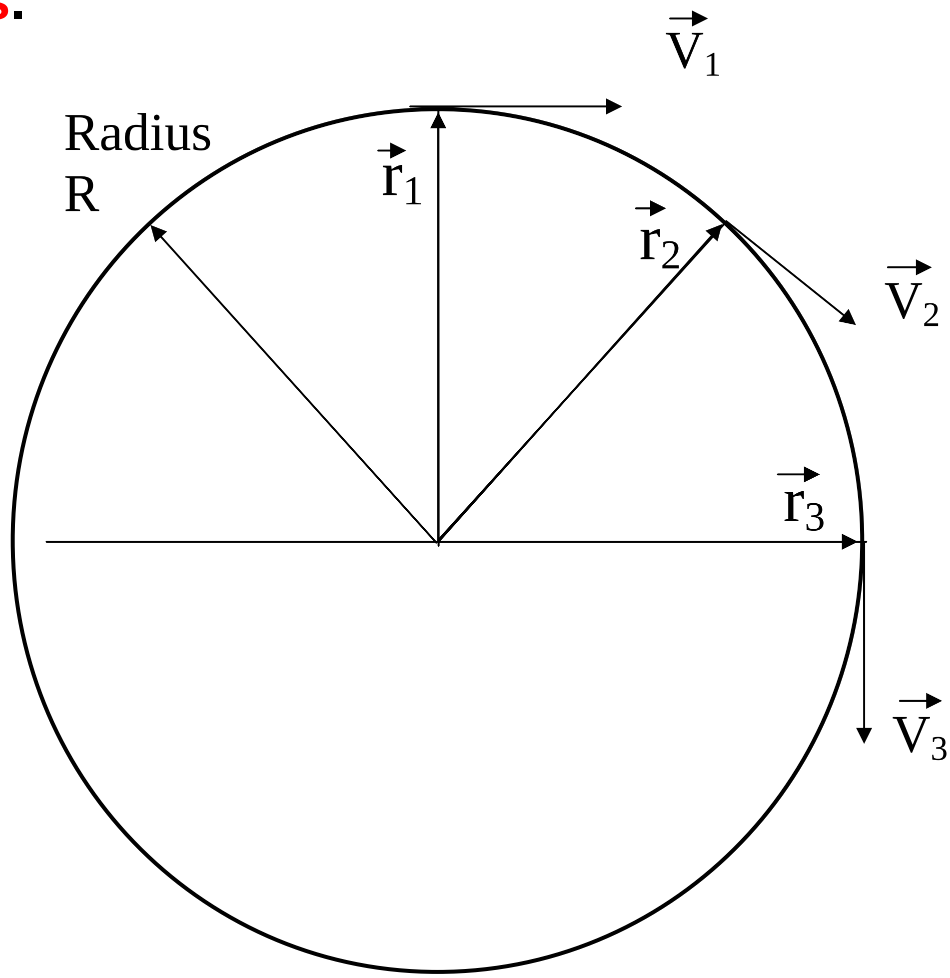
Chapter 3 of Tipler & Mosca, section 3
Circular Motion

1. Uniform Circular motion:

a.) Constant speed, go around a circle or just part of one (an arc). Speed and radius.

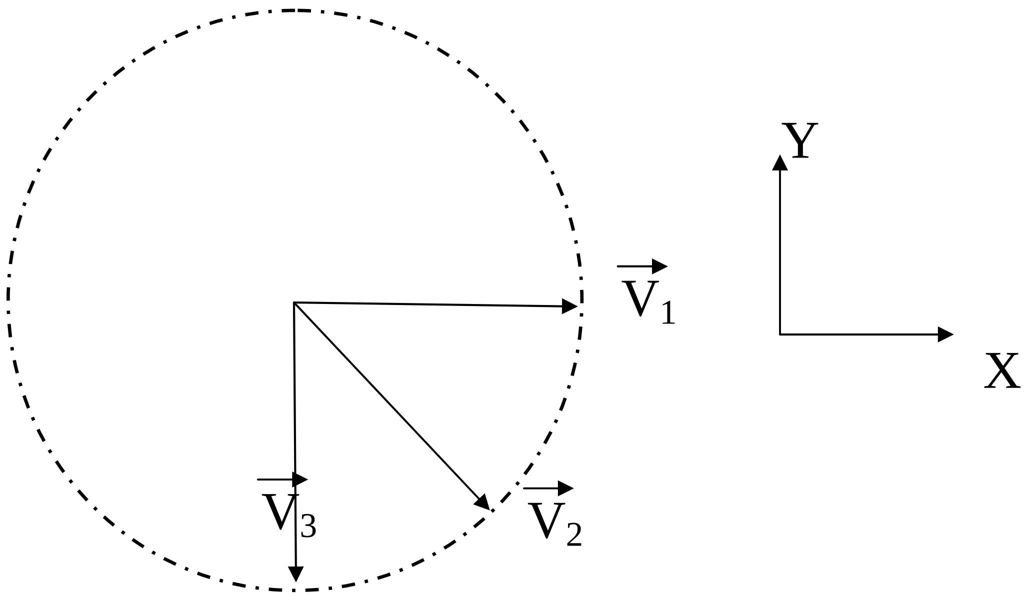


b.) Velocity vector is changing, so there is acceleration.

c.) *T* is period for complete circle, so

$$V = 2\pi R / T$$

d.) Put velocity vectors on a plot, with tails at the origin:



Tip of $\vec{V}$ goes around circle in period ***T***. radius of this circle is ***V***.

Thus rate of change of $\vec{V}$ with time is $a = 2\pi V / T$ and since $T = 2\pi R / V$

$$a = V^2 / R$$

called **Centripetal Acceleration**

e.) **NOT a constant** acceleration.
Magnitude is constant but
Direction rotates.
Points toward center of circle.
Demo.

f.) Clicker problem

A satellite in “low earth orbit” travels a few hundred km above the surface of the Earth. The orbit radius is 7×10^{6} m. If g is still $9.8\ m/s^2$ at that height, what is the speed of the satellite?

A. 7.0×10^{7} **m/s**

B. 8.3×10^{3} **m/s**

C. 6.3×10^{3} **m/s**

D. 4.3×10^{3} **m/s**

E. 5.0×10^{7} **m/s**

2. "Circular" motion with change of speed

a.) Centripetal acceleration always perpendicular to $\vec{V}$ (toward inside of turn)

b.) Change of speed result of Tangential acceleration. (parallel to $\vec{V}$ -- just like one dimensional case.)

c.) Homework problem example.

3. General case of "curvy" motion

a.) At any point along a particle's path the acceleration vector has
one component parallel to $\vec{V}$ and another perpendicular.
That is all there is.

b.) Parallel component is the tangential acceleration – changes speed.

c.) Perp component is centripetal acceleration – changes direction.

d.) What about the projectile?